Science Standard Articulated by Grade Level
Strand 4: Life Science

Concept 1: Characteristics of Organisms

Understand that basic structures in plants and animals serve a function.

Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4
PO 1. Distinguish between living things and nonliving things.	PO 1. Identify the following as characteristics of living things: • growth and development • reproduction • response to stimulus	PO 1. Identify animal structures that serve different functions (e.g., sensory, defense, locomotion).	PO 1. Describe the function of the following plant structures: • roots – absorb nutrients • stems – provide support • leaves – synthesize food • flowers – attract pollinators and produce seeds for reproduction	PO 1. Compare structures in plants (e.g., roots, stems, leaves, flowers) and animals (e.g., muscles, bones, nerves) that serve different functions in growth and survival.
PO 2. Name the following human body parts: • head • shoulders • arms • elbows • wrists • hands • fingers • legs • hips • knees • ankles • feet • heels • toes (See 1CH-R3-01)	PO 2. Compare the following observable features of living things: • movement – legs, wings • protection – skin, feathers, tree bark • respiration – lungs, gills • support – plant stems, tree trunks	PO 2. Identify the following major parts of: • the digestive system – mouth, esophagus, stomach, small and large intestines • respiratory system – nose, trachea, lungs, diaphragm • circulatory system – heart, arteries, veins, blood (See 1CH-F3-01)		PO 2. Classify animals by identifiable group characteristics: • vertebrates – mammals, birds, fish, reptiles, amphibians • invertebrates – insects, arachnids

Italics denote a repetition of a performance objective (learned in an earlier grade) that is to be applied to grade level content or at a higher level of complexity.
The bulleted items within a performance objective indicate the specific content to be taught.

Science Standard Articulated by Grade Level
Strand 4: Life Science

Concept 1: Characteristics of Organisms Understand that basic structures in plants and animals serve a function.				
Kindergarten	**Grade 1**	**Grade 2**	**Grade 3**	**Grade 4**
PO 3. Identify the five senses and their related body parts: • sight – eyes • hearing – ears • smell – nose • taste – tongue • touch – skin	PO 3. Identify observable similarities and differences (e.g., number of legs, body coverings, size) between/among different groups of animals.	PO 3. Describe the basic functions of the following systems: • digestive – breakdown and absorption of food, disposal of waste • respiratory – exchange of oxygen and carbon dioxide • circulatory – transportation of nutrients and oxygen throughout the body (See 1CH-F3-02)		

Italics denote a repetition of a performance objective (learned in an earlier grade) that is to be applied to grade level content or at a higher level of complexity.
The bulleted items within a performance objective indicate the specific content to be taught.

Concept 1: Structure and Function in Living Systems Understand the relationships between structures and functions of organisms.			
Grade 5	**Grade 6**	**Grade 7**	**Grade 8**
PO 1. Identify the functions and parts of the skeletal system: • protection – rib cage, cranium • support – vertebrae • movement – pelvis, femur, hip	PO 1. Explain the importance of water to organisms.		
PO 2. Identify the following types of muscles: • cardiac – heart • smooth – stomach • skeletal – biceps	PO 2. Describe the basic structure of a cell, including: • cell wall • cell membrane • nucleus		
PO 3. Identify the functions and parts of the nervous system: • control center – brain • relay mechanism – spinal cord • transport messages – nerves	PO 3. Describe the function of each of the following cell parts: • cell wall • cell membrane • nucleus		
PO 4. Distinguish between voluntary and involuntary responses.	PO 4. Differentiate between plant and animal cells.		
	PO 5. Explain the hierarchy of cells, tissues, organs, and systems.		

Italics denote a repetition of a performance objective (learned in an earlier grade) that is to be applied to grade level content or at a higher level of complexity.
The bulleted items within a performance objective indicate the specific content to be taught.

Concept 1: Structure and Function in Living Systems Understand the relationships between structures and functions of organisms.			
Grade 5	**Grade 6**	**Grade 7**	**Grade 8**
	PO 6. Relate the following structures of living organisms to their functions: Animals • respiration – gills, lungs • digestion – stomach, intestines • circulation – heart, veins, arteries, capillaries • locomotion – muscles, skeleton Plants • transpiration – stomata, roots, xylem, phloem • absorption – roots, xylem, phloem • response to stimulus (phototropism, hydrotropism, geotropism) – roots, xylem, phloem		
	PO 7. Describe how the various systems of living organisms work together to perform a vital function: • respiratory and circulatory • muscular and skeletal • digestive and excretory		

Italics denote a repetition of a performance objective (learned in an earlier grade) that is to be applied to grade level content or at a higher level of complexity.
The bulleted items within a performance objective indicate the specific content to be taught.

Concept 1: The Cell

Understand the role of the cell and cellular processes.

High School

PO 1. Describe the role of energy in cellular growth, development, and repair.

PO 2. Compare the form and function of prokaryotic and eukaryotic cells and their cellular components.

PO 3. Explain the importance of water to cells.

PO 4. Analyze mechanisms of transport of materials (e.g., water, ions, macromolecules) into and out of cells:

- passive transport
- active transport

PO 5. Describe the purposes and processes of cellular reproduction.

Italics denote a repetition of a performance objective (learned in an earlier grade) that is to be applied to grade level content or at a higher level of complexity.
The bulleted items within a performance objective indicate the specific content to be taught.

Concept 2: Life Cycles Understand the life cycles of plants and animals.				
Kindergarten	**Grade 1**	**Grade 2**	**Grade 3**	**Grade 4**
PO 1. Describe that most plants and animals will grow to physically resemble their parents.	PO 1. Identify stages of human life (e.g., infancy, adolescence, adulthood).	PO 1. Describe the life cycles of various insects.	PO 1. Compare life cycles of various plants (e.g., conifers, flowering plants, ferns).	
	PO 2. Identify similarities and differences between animals and their parents. (See 1CH-F4)	PO 2. Describe the life cycles of various mammals.	PO 2. Explain how growth, death, and decay are part of the plant life cycle.	
		PO 3. Compare the life cycles of various organisms.		

Italics denote a repetition of a performance objective (learned in an earlier grade) that is to be applied to grade level content or at a higher level of complexity.
The bulleted items within a performance objective indicate the specific content to be taught.

Concept 2: Reproduction and Heredity Understand the basic principles of heredity.			
Grade 5	**Grade 6**	**Grade 7**	**Grade 8**
			PO 1. Explain the purposes of cell division: • growth and repair • reproduction
			PO 2. Explain the basic principles of heredity using the human examples of: • eye color • widow's peak • blood type
			PO 3. Distinguish between the nature of dominant and recessive traits in humans.

Concept 2: Molecular Basis of Heredity Understand the molecular basis of heredity and resulting genetic diversity.
High School
PO 1. Analyze the relationships among nucleic acids (DNA, RNA), genes, and chromosomes. PO 2. Describe the molecular basis of heredity, in viruses and living things, including DNA replication and protein synthesis. PO 3. Explain how genotypic variation occurs and results in phenotypic diversity. PO 4. Describe how meiosis and fertilization maintain genetic variation.

Italics denote a repetition of a performance objective (learned in an earlier grade) that is to be applied to grade level content or at a higher level of complexity.
The bulleted items within a performance objective indicate the specific content to be taught.

Concept 3: Organisms and Environments Understand the relationships among various organisms and their environment.				
Kindergarten	**Grade 1**	**Grade 2**	**Grade 3**	**Grade 4**
PO 1. Identify some plants and animals that exist in the local environment.	*PO 1. Identify some plants and animals that exist in the local environment.*		PO 1. Identify the living and nonliving components of an ecosystem.	PO 1. Describe ways various resources (e.g., air, water, plants, animals, soil) are utilized to meet the needs of a population.
PO 2. Identify that plants and animals need the following to grow and survive: • food • water • air • space	PO 2. Compare the habitats (e.g., desert, forest, prairie, water, underground) in which plants and animals live.		PO 2. Examine an ecosystem to identify microscopic and macroscopic organisms.	PO 2. Differentiate renewable resources from nonrenewable resources.
PO 3. Describe changes observed in a small system (e.g., ant farm, plant terrarium, aquarium).	PO 3. Describe how plants and animals within a habitat are dependent on each other.		PO 3. Explain the interrelationships among plants and animals in different environments: • producers – plants • consumers – animals • decomposers – fungi, insects, bacteria	PO 3. Analyze the effect that limited resources (e.g., natural gas, minerals) may have on an environment.
			PO 4. Describe how plants and animals cause change in their environment.	PO 4. Describe ways in which resources can be conserved (e.g., by reducing, reusing, recycling, finding substitutes).

Italics denote a repetition of a performance objective (learned in an earlier grade) that is to be applied to grade level content or at a higher level of complexity.
The bulleted items within a performance objective indicate the specific content to be taught.

Concept 3: Organisms and Environments Understand the relationships among various organisms and their environment.				
Kindergarten	**Grade 1**	**Grade 2**	**Grade 3**	**Grade 4**
			PO 5. Describe how environmental factors (e.g., soil composition, range of temperature, quantity and quality of light or water) in the ecosystem may affect a member organism's ability to grow, reproduce, and thrive.	

Italics denote a repetition of a performance objective (learned in an earlier grade) that is to be applied to grade level content or at a higher level of complexity.
The bulleted items within a performance objective indicate the specific content to be taught.

Concept 3: Populations of Organisms in an Ecosystem Analyze the relationships among various organisms and their environment.			
Grade 5	**Grade 6**	**Grade 7**	**Grade 8**
	PO 1. Explain that sunlight is the major source of energy for most ecosystems. (See Strand 5 Concept 3 and Strand 6 Concept 2)	PO 1. Compare food chains in a specified ecosystem and their corresponding food web.	
	PO 2. Describe how the following environmental conditions affect the quality of life: • water quality • climate • population density • smog	PO 2. Explain how organisms obtain and use resources to develop and thrive in: • niches • predator/prey relationships	
		PO 3. Analyze the interactions of living organisms with their ecosystems: • limiting factors • carrying capacity	
		PO 4. Evaluate data related to problems associated with population growth (e.g., overgrazing, forest management, invasion of non-native species) and the possible solutions.	
		PO 5. Predict how environmental factors (e.g., floods, droughts, temperature changes) affect survival rates in living organisms.	

Italics denote a repetition of a performance objective (learned in an earlier grade) that is to be applied to grade level content or at a higher level of complexity.
The bulleted items within a performance objective indicate the specific content to be taught.

Concept 3: Populations of Organisms in an Ecosystem Analyze the relationships among various organisms and their environment.			
Grade 5	**Grade 6**	**Grade 7**	**Grade 8**
		PO 6. Create a model of the interactions of living organisms within an ecosystem.	

Concept 3: Interdependence of Organisms Analyze the relationships among various organisms and their environment.
High School
PO 1. Identify the relationships among organisms within populations, communities, ecosystems, and biomes. PO 2. Describe how organisms are influenced by a particular combination of biotic (living) and abiotic (nonliving) factors in an environment. PO 3. Assess how the size and the rate of growth of a population are determined by birth rate, death rate, immigration, emigration, and carrying capacity of the environment.

Italics denote a repetition of a performance objective (learned in an earlier grade) that is to be applied to grade level content or at a higher level of complexity.
The bulleted items within a performance objective indicate the specific content to be taught.

Concept 4: Diversity, Adaptation and Behavior Identify plant and animal adaptations.				
Kindergarten	**Grade 1**	**Grade 2**	**Grade 3**	**Grade 4**
			PO 1. Identify adaptations of plants and animals that allow them to live in specific environments.	PO 1. Recognize that successful characteristics of populations are inherited traits that are favorable in a particular environment.
			PO 2. Describe ways that species adapt when introduced into new environments.	PO 2. Give examples of adaptations that allow plants and animals to survive. • camouflage – horned lizards, coyotes • mimicry – Monarch and Viceroy butterflies • physical – cactus spines • mutualism – species of acacia that harbor ants, which repel other harmful insects
			PO 3. Cite examples of how a species' inability to adapt to changing conditions in the ecosystem led to the extinction of that species.	

Italics denote a repetition of a performance objective (learned in an earlier grade) that is to be applied to grade level content or at a higher level of complexity.
The bulleted items within a performance objective indicate the specific content to be taught.

Concept 4: Diversity, Adaptation and Behavior Identify structural and behavioral adaptations.			
Grade 5	**Grade 6**	**Grade 7**	**Grade 8**
			PO 1. Explain how an organism's behavior allows it to survive in an environment.
			PO 2. Describe how an organism can maintain a stable internal environment while living in a constantly changing external environment.
			PO 3. Determine characteristics of organisms that could change over several generations.
			PO 4. Compare the symbiotic and competitive relationships in organisms within an ecosystem (e.g., lichen, mistletoe/tree, clownfish/sea anemone, native/non-native species).
			PO 5. Analyze the following behavioral cycles of organisms: • hibernation • migration • dormancy (plants)
			PO 6. Describe the following factors that allow for the survival of living organisms: • protective coloration • beak design • seed dispersal • pollination

Italics denote a repetition of a performance objective (learned in an earlier grade) that is to be applied to grade level content or at a higher level of complexity.
The bulleted items within a performance objective indicate the specific content to be taught.

Concept 4: Biological Evolution

Understand the scientific principles and processes involved in biological evolution.

High School

PO 1. Identify the following components of natural selection, which can lead to speciation:

- potential for a species to increase its numbers
- genetic variability and inheritance of offspring due to mutation and recombination of genes
- finite supply of resources required for life
- selection by the environment of those offspring better able to survive and produce offspring

PO 2. Explain how genotypic and phenotypic variation can result in adaptations that influence an organism's success in an environment.

PO 3. Describe how the continuing operation of natural selection underlies a population's ability to adapt to changes in the environment and leads to biodiversity and the origin of new species.

PO 4. Predict how a change in an environmental factor (e.g., rainfall, habitat loss, non-native species) can affect the number and diversity of species in an ecosystem.

PO 5. Analyze how patterns in the fossil record, nuclear chemistry, geology, molecular biology, and geographical distribution give support to the theory of organic evolution through natural selection over billions of years and the resulting present day biodiversity.

PO 6. Analyze, using a biological classification system (i.e., cladistics, phylogeny, morphology, DNA analysis), the degree of relatedness among various species.

Italics denote a repetition of a performance objective (learned in an earlier grade) that is to be applied to grade level content or at a higher level of complexity.
The bulleted items within a performance objective indicate the specific content to be taught.

Concept 5: Matter, Energy, and Organization in Living Systems (Including Human Systems)

Understand the organization of living systems, and the role of energy within those systems.

High School

PO 1. Compare the processes of photosynthesis and cellular respiration in terms of energy flow, reactants, and products.

PO 2. Describe the role of organic and inorganic chemicals (e.g., carbohydrates, proteins, lipids, nucleic acids, water, ATP) important to living things.

PO 3. Diagram the following biogeochemical cycles in an ecosystem:
- water
- carbon
- nitrogen

PO 4. Diagram the energy flow in an ecosystem through a food chain.

PO 5. Describe the levels of organization of living things from cells, through tissues, organs, organ systems, organisms, populations, and communities to ecosystems.

Italics denote a repetition of a performance objective (learned in an earlier grade) that is to be applied to grade level content or at a higher level of complexity.
The bulleted items within a performance objective indicate the specific content to be taught.